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Artikel Asli/*Original Article*

The Cost of Radiology Procedures Using Activity Based Costing (ABC) for Development of Cost Weights in Implementation of Casemix System in Malaysia

(Kos Prosedur Radiologi Menggunakan Pengkosan Berasaskan Aktiviti (PBA) untuk Membangunkan Pemberat Kos dalam Implementasi Sistem Casemix di Malaysia)

ROSZITA IBRAHIM, AMRIZAL MUHD NUR, S. A. ZAFIRAH & SYED MOHAMED ALJUNID

ABSTRACT

Presently there is a gross lack of information on cost and cost weights in many developing countries that implement casemix system. Furthermore, studies that employed Activity Based Costing method (ABC) to estimate the costs of radiology procedures were rarely done in developing countries, including Malaysia. The main objective of this study is to determine the costs of radiology procedures for each group in casemix system, in order to develop cost weights to be used in the implementation of the casemix system. An economic evaluation study was conducted in all units in the Department of Radiology in the first teaching hospital using the casemix system in Malaysia. From the 25,754 cases, 16,173 (62.8%) of them were from medical discipline. Low One Third and High One Third (L3H3) method was employed to trim the outlier cases. Output from the trimming, 15,387 cases were included in the study. The results revealed that the total inpatients' charges of all the radiology procedures was RM1,820,533.00 while the cost imputed using ABC method was RM2,970,505.54. The biggest cost component were human resources in Radiology Unit (Mobile) (57.5%), consumables (78.5%) of Endovascular Interventional Radiology (EIR) Unit, equipment (81.4%) of Magnetic Resonance Imaging (MRI) Unit, reagents (68.1%) of Medical Nuclear Unit. The one highest radiology cost weight, was for Malaysia Diagnosis Related Group (MY-DRG®) B-4-11-II (Hepatobiliary and Pancreas Neoplasms with severity level II, 2.8301). The method of calculation of the cost of procedures need to be revised by the hospital as findings from this study showed that the cost imposed to patient is lower than the actual cost.

Keywords: Activity Based Costing (ABC); radiological procedures; casemix; cost components; cost weights

ABSTRAK

Pada masa kini masih terdapat kekurangan maklumat penting mengenai kos dan pemberat kos bagi kebanyakan negara-negara membangun yang menggunakan sistem casemix. Tambahan pula, didapati kajian yang menggunakan kaedah Pengkosan Berasaskan Aktiviti (PBA) untuk menganggarkan kos prosedur radiologi jarang dilakukan di negara-negara membangun, termasuk Malaysia. Objektif utama kajian ini adalah untuk menentukan kos prosedur radiologi bagi setiap kumpulan di dalam sistem casemix dalam usaha untuk membangunkan pemberat kos yang akan digunakan dalam pelaksanaan sistem casemix itu. Kajian penilaian ekonomi telah dijalankan di semua unit di Jabatan Radiologi di hospital pengajar pertama yang menggunakan sistem casemix di Malaysia. Pada tahun 2011, sebanyak 121,221 prosedur radiologi dijalankan dan dari data casemix sebanyak 25,754 kes 16,173 (62.8%) adalah daripada kes disiplin perubatan. Hasil daripada kaedah cantasan melalui kaedah Low One Third and High One Third (L3H3), hanya 15,387 kes yang terlibat pada kajian ini. Hasil kajian menunjukkan jumlah kadar caj bagi semua prosedur radiologi adalah RM1,820,533.00, dengan menggunakan kaedah PBA anggaran kos sepatutnya adalah RM2,970,505.54. Hasil kajian menunjukkan komponen kos terbesar ialah daripada tenaga sumber manusia iaitu di Unit Radiologi (Gerak) (57.5%), bahan pakai habis (78.5%) daripada Endovascular Interventional Radiology (EIR) Unit, peralatan (81.4%) daripada Magnetic Resonance Imaging (MRI) Unit, reagen (68.1%) daripada Unit Perubatan Nuklear. Pemberat kos radiologi paling tinggi adalah daripada Malaysia Diagnosis Related Group (MY-DRG®) B-4-11-II (Hepatobiliari dan Neoplasms Pankreas dengan tahap ketenatan II, 2,8301). Daripada kaedah pengiraan kos prosedur ini dapat membuktikan kos pesakit adalah lebih daripada anggaran kos sebenar.

Kata kunci: Pengkosan Berasaskan Aktiviti (PBA); prosedur radiologi; casemix; komponen kos; pemberat kos

INTRODUCTION

In Malaysia, radiology procedure services are found to be increasingly abreast with medical science technological progress. In every hospital, the radiology procedure is one of the most significant component of a patient's treatment cost that involves the cost of examination of patients, processing of tests, and producing the results.

Deficiency in this of service would pose huge challenges to doctors diagnose and provide effective treatment to patients. According to Alrashdan et al. (2012) the radiology procedure cost is a component of the total cost of patients undergoing treatment in a hospital and this cost components have not been calculated in a systematic way. In the cost analysis study, there are two common costing methods namely Step-Down costing and Activity Based Costing (ABC) that are widely used. Step-down costing is also known as top down costing or macro costing. In other terms, gross costing may also be used to describe step-down in determining a unit cost. In certain circumstances, step-down costing is applicable to be used in a situation where data on specific services are inadequate (Barnett 2009).

The hospital need to develop a proper charging rates in order to obtain adequate revenue to cover the increasing expenditures. ABC is a costing technique that allows organizations to determine the actual costs associated with their services based on the resources they consumed and quantitatively all the cost and performance of activities, resources and cost items, e.g. procedures, investigation, laboratory tests, drugs, etc. ABC was introduced in the United States as a tool to measure the costs of various products in the manufacturing sector, service industry and later in the 90's presented to the healthcare industry and rarely utilised in the field of health (Laurila et al. 2000; Atif et al. 2012; McDowell 2005; Popesko & Tuckova 2012).

Since the establishement of Universiti Kebangsaan Malaysia Medical Centre (UKMMC) as a teaching hospital, no studies was conducted on the cost of the radiology procedures. Thus, it is rather difficult for the management to determine the exact resources used and cost components involved (Negrini, 2004). The hospital is also facing difficulty to find the cost of the radiology procedures and to set the rate for charging. The overall hospital expenditure shows an increasing trend from RM260 million in 2005 to RM408 million in 2010 (UKMMC Annual report 2012). The ABC is the accurate method to find out information in respect of the cost compared to other traditional methods (Shander et al. 2010). Findings from previous studies indicated that many industries use the ABC method with positive outcome (Kuchta & Zabek 2011; Nisenbeum et al. 2000; Javid et al. 2015; Shander et al. 2010; Suthummanon et al. 2005; Lievens et al. 2003; Rajabi & Dabiri 2012; James 2013).

Presently, the average cost for a radiology procedure for every Diagnosis Related Group (DRG) in most hospitals is still unknown. Most costing analyses in hospitals are focused mainly on the costly surgical procedures (Alrashdan et al. 2012). Casemix system is a system that classifies patients based on the diagnosis and procedures and the associated cost (Palmer & Reid 2001). The casemix concept aims to facilitate the process of monitoring patients and the cost of treatment by combining patients who have the same clinical feature into one homogeneous cluster named a DRG. Casemix system is based on the International Classification of Diseases (ICD) 10 for diagnosis and ICD 9 Clinical Modification (CM) for procedures (Zafirah et al. 2017, Mathauer & Wittenbecher 2013). This system was first officially implemented in UKMMC on the 15th of July 2002. The teaching hospital adopted the Malaysia Diagnosis Related Group (MY-DRG®) casemix system that was jointly developed by researchers from UKMMC and United Nations University (Ali Jadoo et al. 2015). In the implementation of casemix system in this teaching hospital, MY-DRG® grouper is being used. Generally, it is equivalent to chapters in ICD-10 and corresponds to body systems and payment package. There were, a total of 25,754 inpatient cases in the casemix database of the teaching hospital in 2011. From the total number, 16,173 (62.8%) inpatients were from Medical disciplines, 5,117 (19.9%) inpatients were Surgical cases, 4,014 (15.6%) cases from the Obstetrics and Gynecology (O&G) discipline and the remaining 450 (1.8%) are Pediatric cases.

In this system, each DRG codes were made up from 5 alphanumeric code (one letter and four numbers). First digit refers to Casemix Main Group (CMG) which refers to body systems (labeled in alphabet (A-Z), based on this grouper that has been encoded includes 22 types of CMG group (Table 1). Fig. 1 is as example of a MY-DRG® code extracted by the MY-DRG® grouper. As seen in the figure, the first alphabet (B) is referring to the CMG (Hepatobiliary and pancreatic system groups), the second digit (4) is referring to the which discipline are the patients assigned to 4 = Medical, (1 = surgical, 6 = O&G, 8 = Pediatric). Case-Based Group (CBG), third and fourth digit refer to specific DRG groups, 11 = Hepatobilary and pancreas neoplasms and the final digit refers to patients' severity level II = moderate (I = mild, III = severe).

The Ministry of Health in Malaysia is aware of the constant increase in cost. Thus, this study aims to make an economic evaluation to determine cost and radiology cost weights using ABC in implementation in MY-DRG®. The study will provide the costing information on radiological procedures and the cost weights that can be use in development of the charging scheme based on casemix system for the teaching hospital. Cost weight is important for determining the prices of payment services (Rajabi & Dabiri 2012). However, it is challenging to gather information on the estimated medical expenditure for each patient, as there are no studies conducted on the detailed costing in this field (Lim et al. 2001).

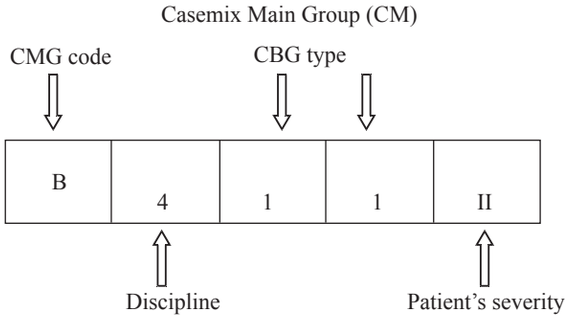

FIGURE 1. MY-DRG® structure

TABLE 1. Lists of Casemix Main Groups (CMG)

Description	Code CMG
Central nervous system groups	G
Eye and adnexa groups	H
Ear, nose, mouth and throat groups	U
Respiratory system groups	J
Cardiovascular system groups	I
Digestive system groups	K
Hepatobiliary and pancreatic system groups	B
Musculoskeletal system and connective tissue groups	M
Skin, subcutaneous tissue and breast groups	L
Endocrine system, nutrition and metabolism groups	E
Nephro urinary system groups	N
Male reproductive system groups	V
Female reproductive system groups	W
Deliveries groups	O
Newborn and neonates groups	P
Haemopoeitic and immune system groups	D
Myeloproliferative system and neoplasm groups	C
Infectious and parasitic diseases groups	A
Mental health and behavioral groups	F
Substance abuse and dependence groups	T
Injuries, poisoning and toxic effects of drug groups	S
Factors influencing health status and other contacts with health services groups	Z

MATERIALS AND METHODS

STUDY DESIGN AND SAMPLE SELECTION

This is an economic evaluation study to determine and estimate the actual cost of radiology procedures in teaching hospital. The duration of this research spanned from February 2012 until January 2013, and it was approved by the Ethics and Research Committee, Faculty of Medicine, UKM in Februari 2012 (UKM 1.5.3.5/244/SPP/FF-058-2012). All cases clustered under medical discipline in the casemix MY-DRG® systems that underwent all radiology services provided by the Radiology Department of the hospital in the year 2011 were included in the study were chosen to be analyzed in this study. This study involves the collection of patient's data from 2 main sources:

MEDICAL CASES DATA FROM CASEMIX MY-DRG® SYSTEM

Data was trimmed using the Low One Third and High One Third (L3H3) method to remove the cases of outliers (Gong et al. 2004; Schenker 2003). L3H3 method was employed to remove the cases of outliers as a perfect fit in the casemix system. As example; J-4-15-III (Respiratory Infections & Inflammations), severe:

a. Average of length of stay in the ward for J-4-15-III = 20.9 days
b. Low One Third (L3) for J-4-15-III = 1/3 × 20.9 days = 6.9 days
c. High One Third (H3) for J-4-15-III = 3 × 20.9 days = 62.7 days

This means that in the J-4-15-III group to be used in the cost analysis, estimation is to have an average of length of stay in the ward between 6.9 days and 62.7 days. Patients who have less or more of the day range are neglected and as data are outliers. From 16,173 cases of medical discipline, a total of 15,387 cases selected for this study and there are 786 outliers cases in the casemix MY-DRG®.

INTEGRATED RADIOLOGY INFORMATION SYSTEM (IRIS)
(For selected patient from medical cases in step 1)

The universal sampling method was employed in this study, whereby all services offered to medical discipline cases in the year 2011 for all radiology procedure conducted in the department were included as the research sample.This study examined 400 radiology procedures offered in the year 2011 (Table 2).

TABLE 2. Number of radiological procedures performed on all units in the department of radiology in 2011

No.	Unit	Number of Radiological Procedures Performed on all Units
1	Magnetic Resonance Imaging (MRI)	65
2	Computerized Tomography Scan (CT Scan)	84
3	Fluoroscopy	15
4	Endovascular Interventional Radiology(EIR)	55
5	Radiology-General	52
	-Mobile	88
6	Ultrasound	22
7	Mammogram	2
8	Medical Nuclear	17
	Total	400

CALCULATION OF COST

An ABC was used to collect the cost of every prosedures carried out in each unit. There were 121,221 radiology procedures done in all units of the the Radiology Department. Cost was estimated using the calculation model below:

Total cost (RM) = Cost of human resource + Cost of consumable + Cost of reagent + Cost of equipment + Cost of administrative + Cost of maintenance + Cost of utility

TYPES OF COST

There were two types of cost used in this study; direct cost and overhead cost. Components of each type of cost are as below;

Direct costs

a. Human resource: The cost of each work process for each diagnostic laboratory services with the number of staff involved, grade, years of service and the time period of performing the work.
b. Consumables: The cost of all consumables used during the diagnostic laboratory services such as Medium dressing set, Stellant Dual, Tube T connector, Mamopads, handpiece etc.
c. Reagents: The cost of all materials, reagents used during the testing laboratory diagnostics such as Barium, Gastrograffin, Contrast, Visipaque, Hydroxy Iminodiacetic Acid etc.
d. Equipment: The cost of the equipment used in the performance of diagnostic laboratory services includes the cost of equipment and the purchase of equipment. The cost of depreciation and replacement costs are also taken into account for the year of more than 5 years and above (Creese & Parker 1994).

Overhead cost

a. Administrative: Assessed based on the cost of employment of staff in the hospital. Administrative costs also include the cost of staff involved indirectly in diagnostic laboratory services.
b. Maintenance: Maintenance costs are costs involved in terms of maintenance of electrical, mechanical, civil, biomedical, solid waste management and other maintenance services.
c. Utility: These costs include the cost of the use of electricity, water, telephone and facsimile in the year.

COST WEIGHTS FROM AVERAGE COST PER EPISODE

The calculation of cost weight was done using the average radiology procedure cost for each MY-DRG® group as the numerator and the average aggregate cost of all MY-DRG® groups as the denominator.

STATISTICAL ANALYSES

All data included in this study administered through the use of the (IBM SPSS version 20). All calculation of cost was done using Ringgit Malaysia (RM).

RESULTS

Through this study, it found that in the year 2011, out of 25,754 inpatient cases, 16,173 (62.8%) cases were from Medical. The total inpatients' charges of all the radiology procedures was RM1,820,533.00 while the cost imputed using ABC method was RM2,970,505.54 and this shows that UKMMC was only charging 61.3% of the total cost of radiology procedures on the patients.Through the casemix MY-DRG® system, the socio demographic data recorded a total of 8,249 (53.6%) patients were Malay and a total of 7,761 (50.4%) cases comprised of males. Cases in the severity level I were 6,868 (44.6%) cases while 3,547 (23.1%) cases recorded at severity level III. Out of these 22 CMGs group in the current system employed by this hospital, the highest radiology procedures cost was involving CMG (G-Central nervous system groups) with the total average

cost per episode was of RM726.42. Details on the top 20 MY-DRG® group with highest cost weight is illustrates in the Table 3. Data analysis on calculation of radiology cost weights showed that from the top 20 highest cost weights among the radiology procedures the cost weight was the highest for MY-DRG® group B-4-11-II (Hepatobiliary & Pancreas Neoplasms) where the cost weight was recorded as 2.8461. The lowest cost weight was MY-DRG® group U-4-15-I (Other Ear, Nose, Mouth & Throat Disorders) where the cost weight was 1.6336. Findings from this study also showed that the highest severity level II was the highest average cost per episode (RM752.07) among radiology procedures, followed by severity level I (RM721.52) and severity level III (RM721.27), respectively.

DIRECT COST

Findings from this study showed that among 4 components under direct cost, 4 units showed a higher cost involving human resource cost. Among the unit with a higher human resource cost was Radiology (Mobile), Radiology (General) Unit, CT Scan Unit and Ultrasound Unit. The findings also showed that, only one unit was the highest cost for consumables and reagent which was Endovascular International Radiology (EIR) Unit and Medical Nuclear Unit for reagent cost. There were three units with equipment cost as the higher cost; (MRI) Unit, Fluoroscopy Unit, and Mammogram Unit. Table 4 shows the percentage of component costs by unit in the Department of Radiology.

OVERHEAD COST

Findings from this study also revealed that, component cost for overhead cost i.e. administrative maintenance and utility were the lowest among other cost (Table 4). The highest cost was only 16.4% involving administrative cost from Radiology (General) Unit. However this amount is considered low compared to the other direct cost components.

TABLE 3. Lists of the 20 highest Cost Weight Among Groups MY- DRG® Radiology Procedures

No.	MY-DRG®	Description	Severity	Average cost (RM) per episode	Cost Weight
1	B-4-11-II	Hepatobiliary & Pancreas Neoplasms	Moderate	1039.29	2.8461
2	B-4-11-III	Hepatobiliary & Pancreas Neoplasms	Severe	1020.20	2.7938
3	G-4-26-I	Other Nervous System Disorders	Mild	1009.26	2.7638
4	C-4-11-II	Lymphoma & Chronic Leukemia	Moderate	838.18	2.2953
5	I-4-15-I	Peripheral & Other Vascular Diseaseas	Mild	782.69	2.1434
6	I-4-15-II	Peripheral & Other Vascular Diseaseas	Moderate	763.44	2.0906
7	G-4-13-I	Non-Traumatic Intracranial Hemorrhage	Mild	738.30	2.0218
8	N-4-10-I	Renal & Urinary Tract Neoplasm & Kidney Failure	Mild	730.39	2.0002
9	M-4-17-II	Medical Back Disorders	Moderate	706.74	1.9354
10	M-4-17-I	Medical Back Disorders	Mild	705.33	1.9315
11	K-4-10-I	Digestive Neoplasms	Mild	699.60	1.9158
12	G-4-15-II	Non-Specificied CVA Without Infarct	Moderate	653.01	1.7882
13	C-4-11-III	Limfoma& Leukemia Kronik	Severe	643.38	1.7619
14	N-4-16-II	Other Renal & Urinary Tract Diseases	Moderate	634.05	1.7363
15	K-4-10-II	Digestive Neoplasms	Moderate	629.76	1.7246
16	J-4-14-III	Respiratory Neoplasms	Severe	624.24	1.7095
17	G-4-22-I	Seizure	Mild	619.78	1.6972
18	G-4-25-I	Concussion	Mild	611.74	1.6752
19	J-4-15-III	Respiratory Infections & Inflammations	Severe	597.25	1.6355
20	U-4-15-I	Other Ear, Nose, Mouth & Throat Disorders	Mild	596.55	1.6336

*USD 1 = RM3.058 (Based on Central Bank of Malaysia Rate, 2011)

TABLE 4. The Percentage of Component Costs by Unit in the Department of Radiology

	Percentage of Component Costs								
	MRI[a]	CTScan[b]	Medical Nuclear	Fluoroscopy	Mammogram	Ultrasound	Radiology (General)	Radiology (Mobile)	EIR[c]
Human resources	7.5	32.8	18.2	6.3	15.6	30.4	53.9	57.5	3.2
Consumables	0.4	10.8	2.4	11.2	19.4	0	0	0	78.5
Reagent	9	32	68.1	4.6	0	25.5	0	0	0
Equipment	81.4	20	9.5	75.8	60	23.6	17.2	18.8	17.9
Administration	0.9	2.7	1	1.2	2.8	11.6	16.4	13.3	0.2
Maintenance	0.5	1	0.5	0.6	1.4	5.7	8	6.6	0.1
Utility	0.3	0.7	0.3	0.3	0.8	3.2	4.5	3.8	0.1
Total (%)	100	100	100	100	100	100	100	100	100

[a]Magnetic Resonance Imaging; [b]Computerized Tomography Scan; [c] Endovascular Interventional Radiology

DISCUSSION

Analysis from this study showed prior the implementation of ABC the total cost imposed on inpatients in this hospital was RM1,820,533.00 and grossly increased to RM2,970,505.54. The results reveal that available rates for inpatient hospital charges for radiology procedures are 61.3% lower than the actual cost. From these data, the management in teaching hospital can manage budgets more systematic and orderly, cost data that ultimately go through this study is immensely useful to be made measure to reduce wastage. Indeed, by using ABC cost that is precise and accurate from activity that is specific or service and to date in Malaysia, ABC system never implemented fully (Laurila et al. 2000). Hada et al. (2014), mentioned that the ABC method could generate more accurate data on costing especially on Nuclear Radiology procedures and hence it should be employed by all relevant departments. Aldogan et al. (2014), mentioned that via the ABC method, the hospital management would be able to generate the indirect cost involved and this can then improve the analysis of profit or income, indirectly enabling them to make decisions on costs. On the other hand, Oseifuah (2014), mentioned that although the ABC method is complicated and involves the high cost to be implemented, it still benefits a range of activities where costs can be improved further, and this again helps the management to make decisions.This result supported by Mercier and Naro (2014) whereby it mentioned that the ABC method would gather more accurate in a cost analysis. This study also provides in-depth information on the types and amount of resources used. By doing this, resources that require proper costing can be monitored to ensure that the quality of services is not jeopardized. This method is also beneficial in organizing data as mentioned by Federowicz et al. (2010).

Most studies involving estimation of costs for radiology procedures usually focus on the cost of consumables and equipment as well as focusing on step-down costing or traditional costing method only (Laurila et al. 2000). According to Cinquini et al. (2009), lack of accurate costing information on hospital services make it necessary to change from the traditional costing system to ABC. ABC is a method that rarely used in the field of health and this has been stated by researchers globally namely Laurila et al. (2000), Atif et al. (2012), McDowell et al. (2005), Popeska & Tuckova (2012). This study employs the ABC method which is being carried out for the first time in a teaching hospital. Findings from previous researchers indicated that many industries use the ABC method with an effective result that is positive (Laurila et al. 2000; Atif et al. 2012; Popeska & Tuckova 2012; Kuchta & Zabek 2011; Nisenbeum et al. 2000; Javid et al. 2015; Shander et al. 2010; Suthummanon et al. 2005).

This study involves a total of four hundred of procedures in the Radiology Department, and it found that such a study involving costing in every type of procedures involving various units, has never been conducted before this. Based on previous local and international research, it found that most researchers revert back to the ABC and focus on procedures or tests. For instance, researchers look at the effectiveness of costing via ABC. Researcher, Nisenbaum et al. (2000) is an example of a researcher who looked at resource utilization and estimated cost that is accurately measurable through the calculation of the cost of every Computed Tomography (CT) procedure. Likewise, a study carried out by Atif et al. (2012) looked at the cost of chest X-ray via the ABC method in the Radiology Department. The studied showed that the total cost for an X-ray chest is RM5.67, where the value weight of the material is higher at 76.8% of the total cost belonged to the X-ray film alone. A research by Javid et al. (2015) revealed that by knowing the exact cost per unit in the medical line enables one to work in a more efficient and honest manner.

With evidence from the ABC method study, the hospital management would be able to calculate the costs accurately, and this leads to the better usage and administration of resources. The findings of this study also revealed that the ABC method is lots of knowledge on the activities conducted were imparted and accurate costs can be identified based on each costing component. Also, the percentage of the

components involved and the highest percentile can also be defined. The findings suggest that the components of human resource are the highest, and this figure contributed by the Radiology (Mobile), Radiology (General), CT Scan Unit, and Ultrasound Unit. This is because the procedure on these units required more experienced staff to carry out a time consuming procedure. Previous research by Javid et al. (2015) also suggests that by using the ABC method, it found that the cost of the human resource is one of the cost components that is the largest from the total overall cost in Kashani Hospital. The findings also suggest that the cost of human resources (47.5%), the cost of equipment and the cost of consumable at the Radiology Department is a significant contributor to the capital cost (29.1%). However, the study doesn't mention the percentage of the cost component mentioned. In another study by Rajabi and Dabiri (2012), the Sinus Photography procedure time used to deliver results is usually 432 hours, however in the findings it revealed a total of 2211 hours. Hence there are resources that capacity is not being maximized, in this scenario a total of 1779 human resource hours and other equipment were underemployed.

This cost weight is significant because the top management of teaching hospital and researchers would be able to identify the distribution of budget and cost that should be rightfully allocated. Futhermore, Schreyogg et al. (2006) concluded that the DRG system was introduced in Germany to distribute and allocate proper resources. It further mentioned that the DRG system here would use in determining a price or cost weight. The price could be described directly if the average cost of long-stay wards per DRG acquired and the amount for each DRG as well be obtained by the group.

The use of ABC is very new and re-assigned most of the forms are incomplete though itemized statement given to the staff of the unit involved. For component equipment maintenance costs are difficult to obtain since the Department of Building Management, in this teaching hospital cannot provide the right value equipment for the maintenance since the cost are of a combined on the overall maintenance costs for every department.

CONCLUSION

The results reveal that available rates for inpatient hospital charges for radiological procedures are 61.3% lower than the actual cost. Findings from this study also showed that the highest radiological cost weights was MY-DRG® group B-4-11-II (Hepatobiliary & Pancreas Neoplasms) where the cost weight was recorded as 2.8461. It was found that, 4 out of 9 units shows the components of human resources is the highest. The results showed the ABC method can be equally important in providing knowledge of the activities carried out and can provide accurate cost calculation and component costs. Implementation of ABC in healthcare institutions required not only changes by calculation procedures, may also change the way of their organizations' functioning. This information can be used to guide health care providers or specialists to make informed decisions regarding the use of appropriate investigations in order to reduce wastages of resources and support efforts for teaching hospital to enhance service efficiency in managing their patients.

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Ibrahim Roszita
Amrizal Muhd Nur
S. A. Zafirah
Syed Mohamed Al Junid
International Centre for Casemix and Clinical Coding (ITCC)
Faculty of Medicine
Universiti Kebangsaan Malaysia
Jalan Yaacob Latif
56000 Bandar Tun Razak
Kuala Lumpur

Ibrahim Roszita
S. A. Zafirah
United Nations University-International Institute for Global Health
Kuala Lumpur (UNU-IIGH)
Hospital Universiti Kebangsaan Malaysia
Jalan Yaacob Latif
56000 Bandar Tun Razak
Kuala Lumpur

Syed Mohamed Aljunid
Department of Health Policy and Management
Faculty of Public Health
Kuwait University
Kuwait

Corresponding author: Roszita Ibrahim
E-mail address: roszita@ppukm.ukm.edu.my

Tel: +603 91456988
Fax: +603 91456685

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